Calculus Warm Up #10-3

Find $\frac{dy}{dx}$

1. $-2e^5$
2. 7^{-x}
3. $\frac{x}{2^x}$

Green WS Answers

1. $f'(3) = \frac{13}{16}$
2. $\frac{1}{3a^2}$
3. Concave down on $\left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$
4. $m = 2$
5. $(0, \pm\sqrt{2})$
6. $y' = 4xe^{2x^2+1}$
7. $f'(x) = \frac{1}{2x-1} - \frac{1}{x} - \frac{3}{x+2}$
8. $\frac{dy}{dx} = (2x)^{2x}(2 + 2\ln(2x))$
9. ∞
10. $-\infty$ or ∞ $\therefore$ DNE

$x \to -1^+$ $\uparrow$ $x \to -1^-$ $\uparrow$

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In Exercises 13–34, find dy/dx.

13. $y = \ln \sqrt{x}$

15. $y = x\sqrt{\ln x}$

17. $y \ln x + y^2 = 0$

19. $\ln y = x \ln x$

21. $y = \frac{1}{b^2}\left[\ln (a + bx) + \frac{a}{a + bx}\right]$

$a(a+bx)^{-1}$

$y' = \frac{1}{b^2} \cdot \frac{1}{(a+bx)} \cdot b + \frac{1}{b^2}\left(-a(a+bx)^{-2}(b)\right)$

$\frac{(a+bx)}{(a+bx)b(a+bx)} - \frac{a}{b(a+bx)^2}$

$\frac{bx}{b(a+bx)^2}$

$\frac{x}{(a+bx)^2}$

23. $y = -\frac{1}{a} \ln \left(\frac{a + bx}{x}\right)$

25. $y = \ln (e^{-x^2})$

27. $y = x^2 e^x$

29. $y = \sqrt{e^{2x} + e^{-2x}}$

31. $y = 3^{(x-1)}$

$y' = (\ln 3)(3^{x-1})(1)$

$y' = 3^{x-1} \ln 3$

33. $ye^x + xe^y = xy$

In Exercises 35–38, find the derivative of the given function. (Assume that a is constant.)

35. $y = x^a$

37. $y = x^x$

November 08, 2017

In Exercises 85–92, use L'Hôpital's Rule to evaluate the given limit.

85. $\lim_{x\to 1} \frac{(\ln x)^2}{x-1}$

87. $\lim_{x\to\infty} \frac{e^{2x}}{x^2}$

89. $\lim_{x\to\infty} (\ln x)^{2/x}$

91. $\lim_{n\to\infty} 1000\left(1+\frac{0.09}{n}\right)^n$

$\ln y = \lim_{x\to\infty}\left[\frac{2}{x}\ln(\ln x)\right]$

$\ln y = \lim_{x\to\infty}\left[\frac{2}{x\ln x}\right]$

let $u = \ln x$

$\frac{dy}{dx} = \frac{1}{x}$

$2 \cdot \frac{1}{\ln x} \cdot \frac{1}{x}$

$\ln y = \frac{2}{\infty}$

$\ln y = \frac{2}{\infty}$

$\ln y = 0$

$e^0 = y$

$y = 1$

In Exercises 85–92, use L'Hôpital's Rule to evaluate the given limit.

85. $\lim_{x\to 1} \frac{(\ln x)^2}{x-1}$

87. $\lim_{x\to\infty} \frac{e^{2x}}{x^2}$

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91. $\lim_{n\to\infty} 1000\left(1+\frac{0.09}{n}\right)^n$

$1000\, e^{0.09}$

$\approx$

Summary:

Indeterminate Forms

$0^0 \quad \infty^0 \quad 1^\infty$	Use Natural Logarithms
$\frac{0}{0} \quad \frac{\infty}{\infty}$	Use L'Hôpital's Rule
$\infty - \infty$	Change the form by adding or subtracting
$0 \cdot \infty$	Change the form to get $\frac{0}{0}$ or $\frac{\infty}{\infty}$ and then use L'Hôpital's Rule

Determinate Forms

$\infty + \infty = \infty \qquad -\infty - \infty = -\infty$ $0^\infty = 0 \qquad \frac{1}{0^\infty} \leftarrow 0^{-\infty} = \infty$	
$\frac{0}{L} \quad \frac{L}{\pm\infty} \quad \frac{0}{\pm\infty}$	Limit is Zero
$\frac{L}{0} \quad \frac{\pm\infty}{L} \quad \frac{\pm\infty}{0}$	Limit is Infinite

HW: Review # 2

Next test is Monday, Nov. 13

Covers: 7.2, 7.5 & 7.8

and past topics:

evaluate limits, continuity, concavity, instantaneous rate of change, implicit differentiation